

Environmental Performance Surface for Support Underwater Laser Imaging Systems & Diver Operations

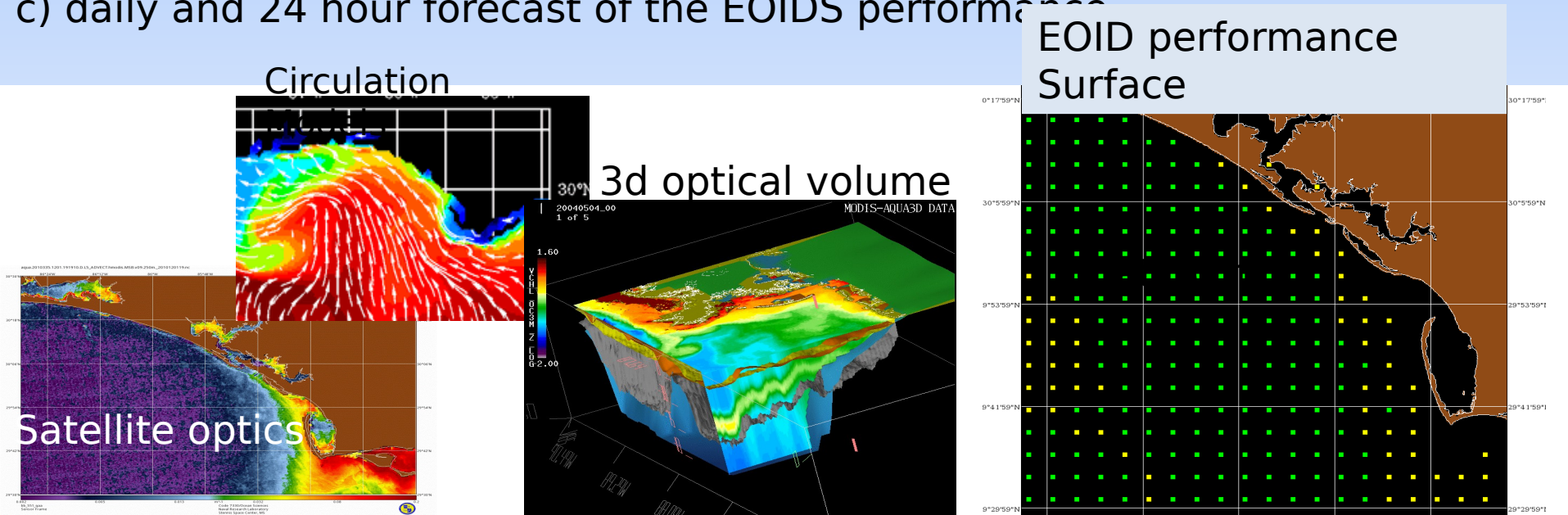


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Stennis Space Center, MS

Proposed support to Vulcan Ex March 2011

Environmental characterization for the Northern Gulf of Mexico

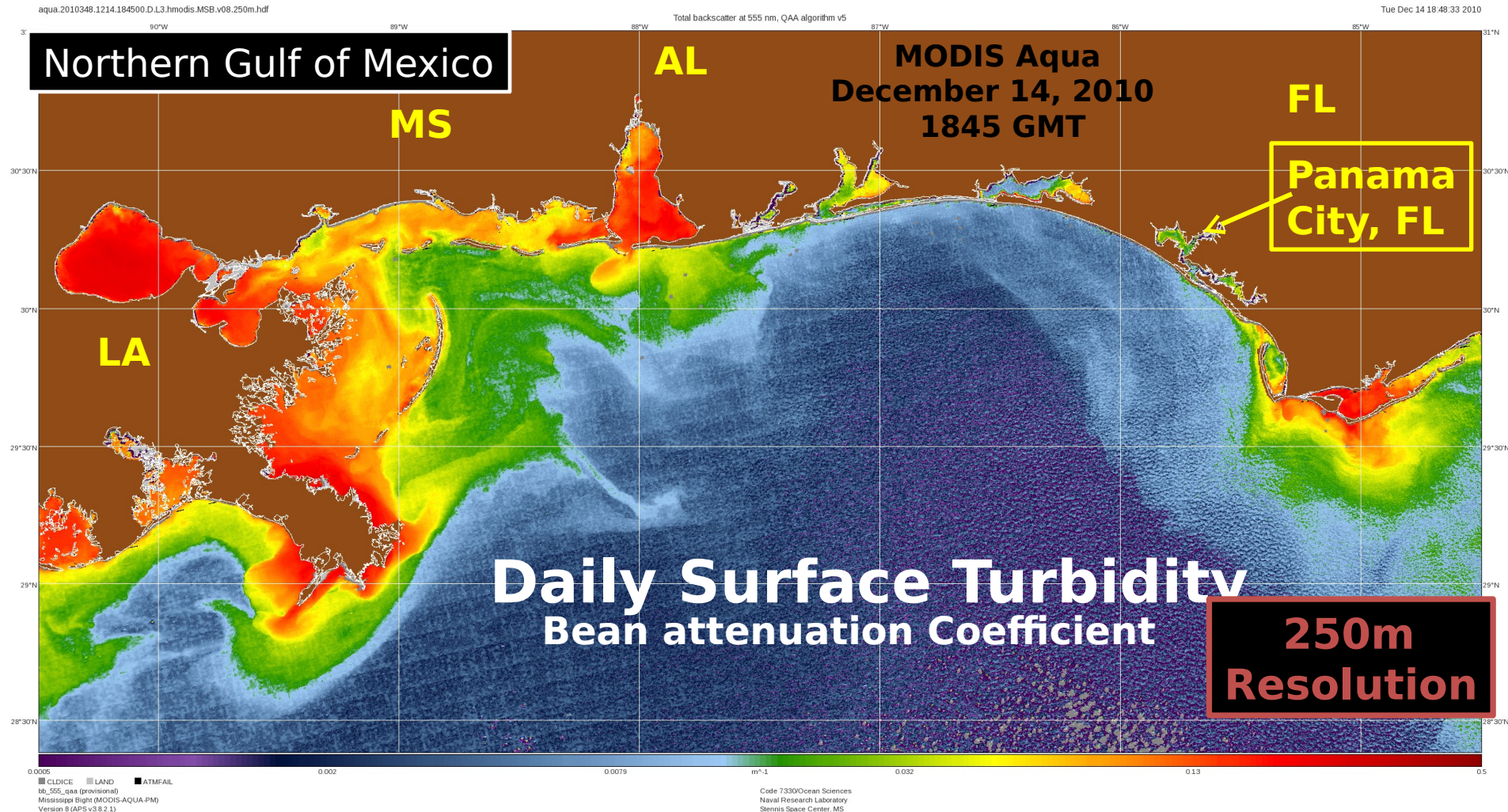
- a) Forecasting the Optical Environment □ Impact on systems (ASQ 24) and Diver visibility
- b) Vertical optical layers
- c) daily and 24 hour forecast of the EOIDS performance

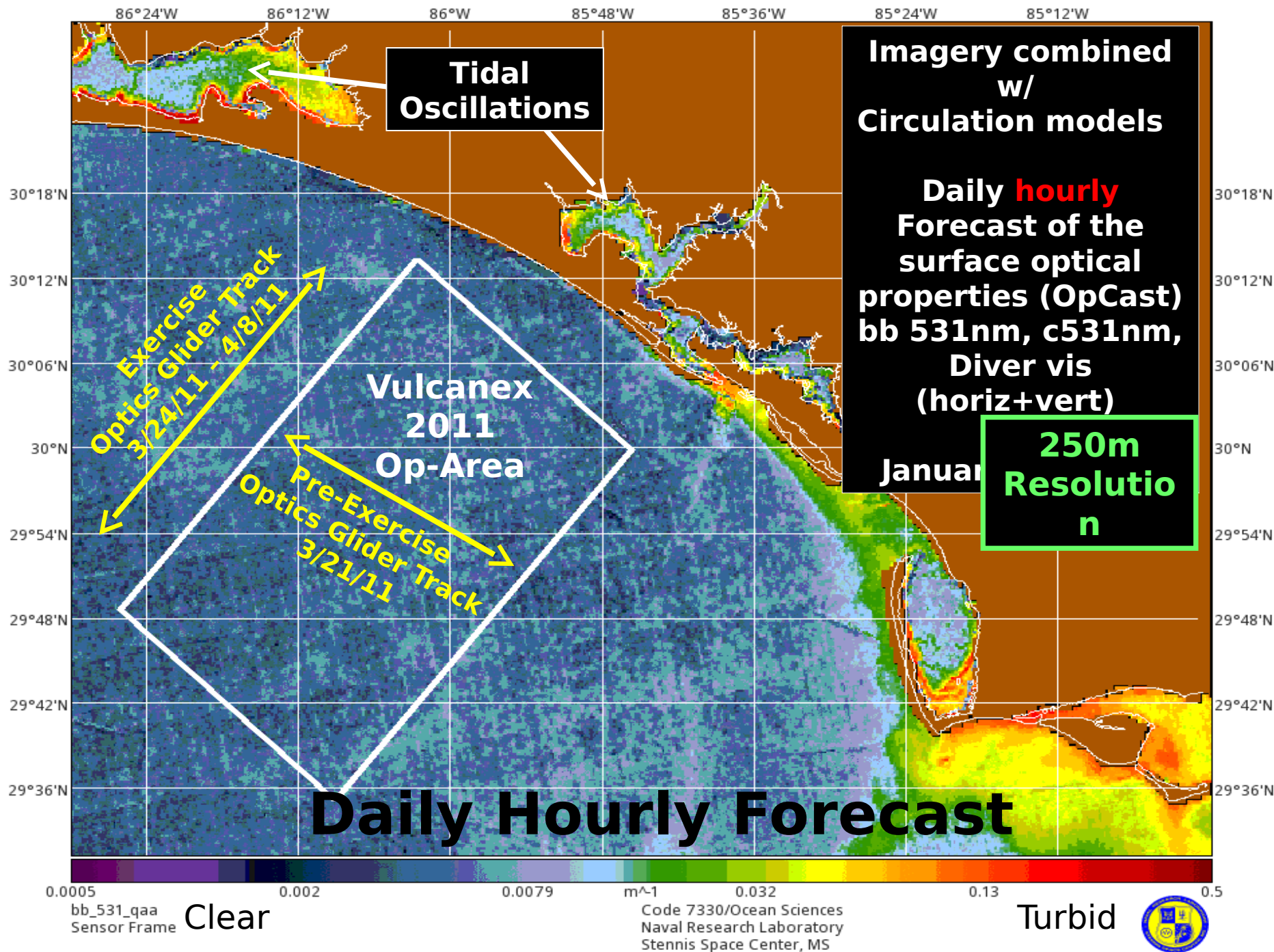




Background:

Satellite ocean color Imagery from provides real time monitoring of the optical properties in the Gulf

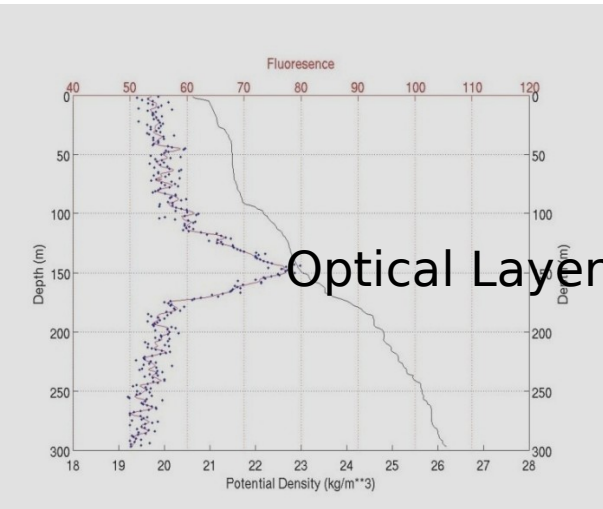




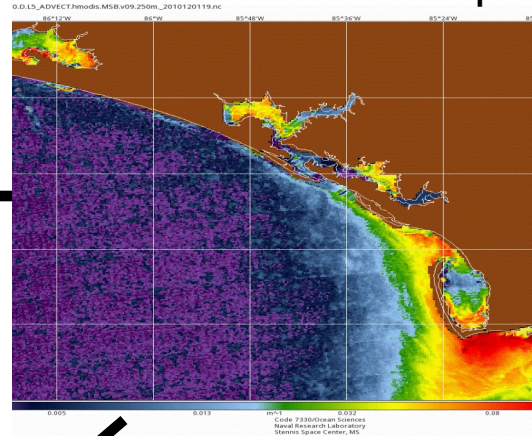
Fusion of Glider Profiles, Satellite and Numerical Models to support AQS24 Operations



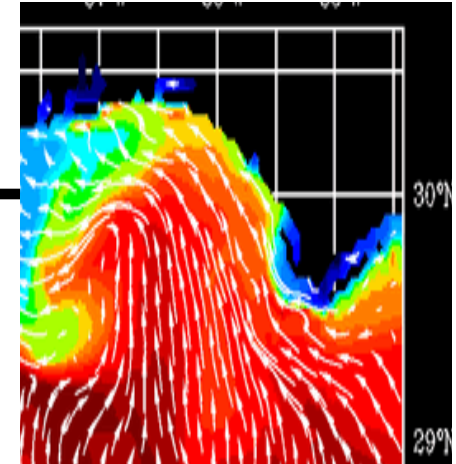
Vertical Optical Profiles
(Glider, BSP, etc.)



Real-Time Satellite Optics



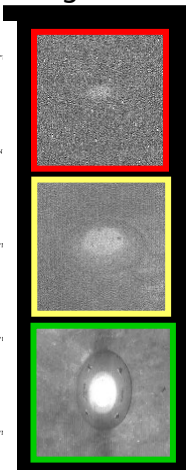
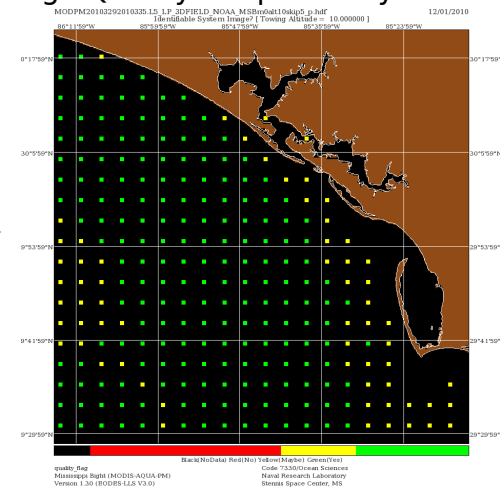
Circulation Models



What Happens
Below
Satellite Surface?

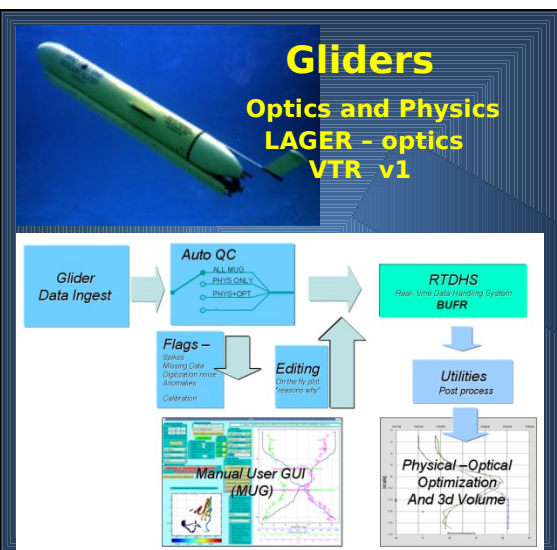
EODES

Laser System Performance Surface Map
Image Quality & Optimal System Towing Altitude

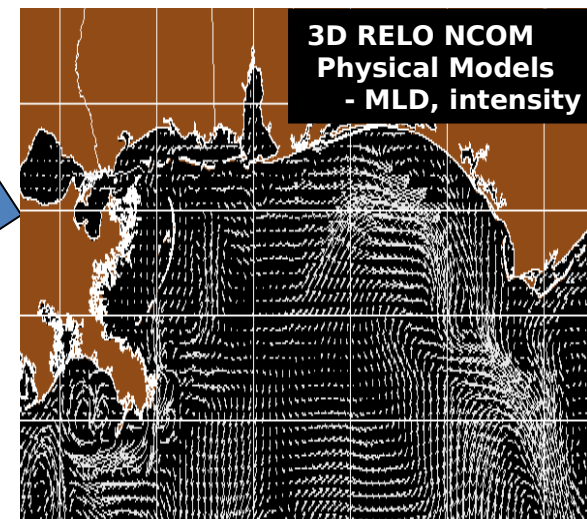
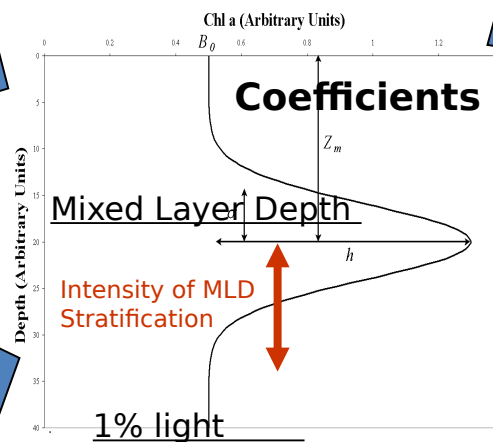


3D Optical Volume

Generation of the 3D Optical Volume (3DOG)

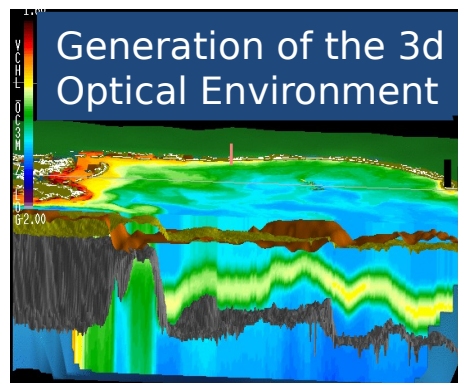
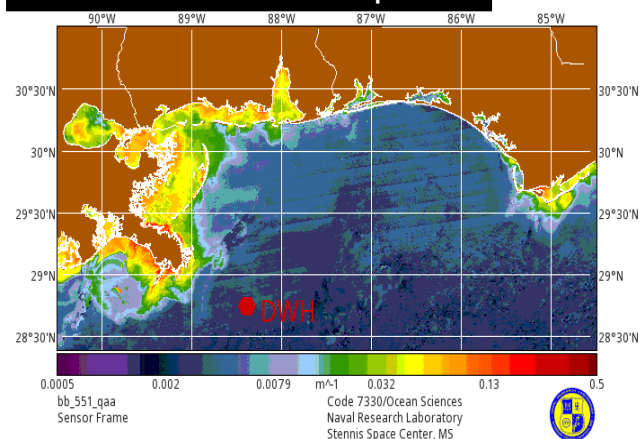


“Fusion of the data sources”
Optics (surface) to physics (subsurface)
Derived through optimization of a
Gaussian Model

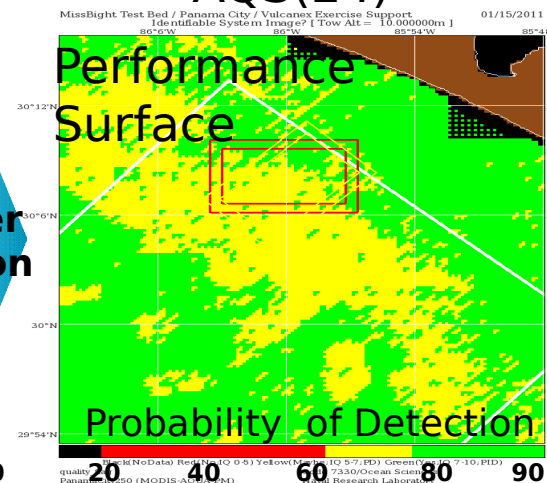


Environmental Decision Aides
For Operational Planning
EOIDS (EODES)
AQS(24)

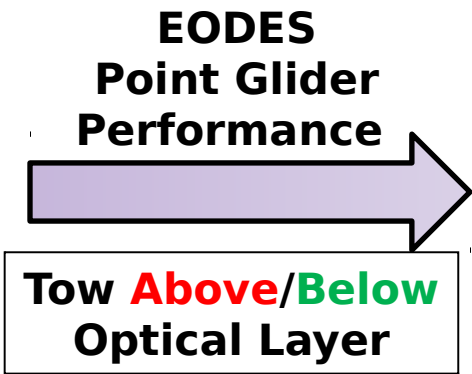
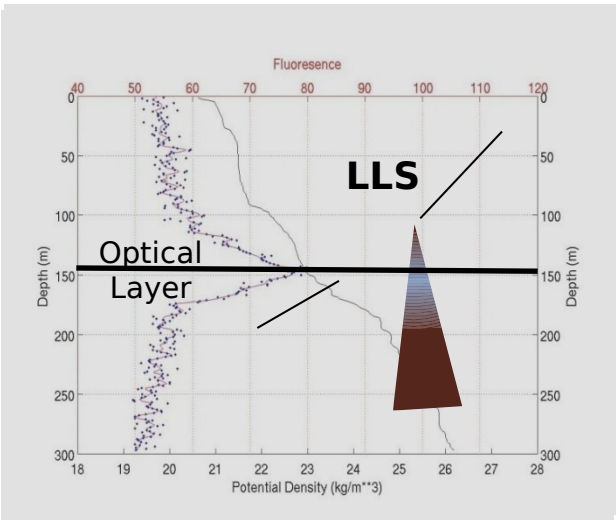
Satellite Surface Optics



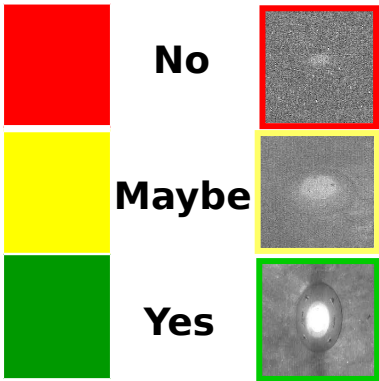
Warfighter Information



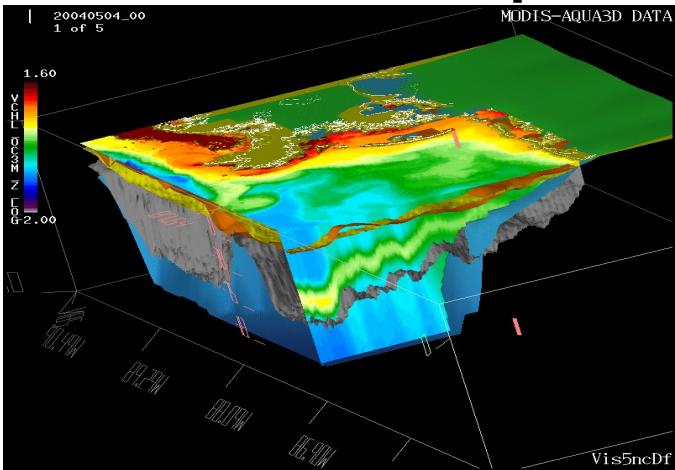
System Performance Surfaces (AQS-24)



Target ID?

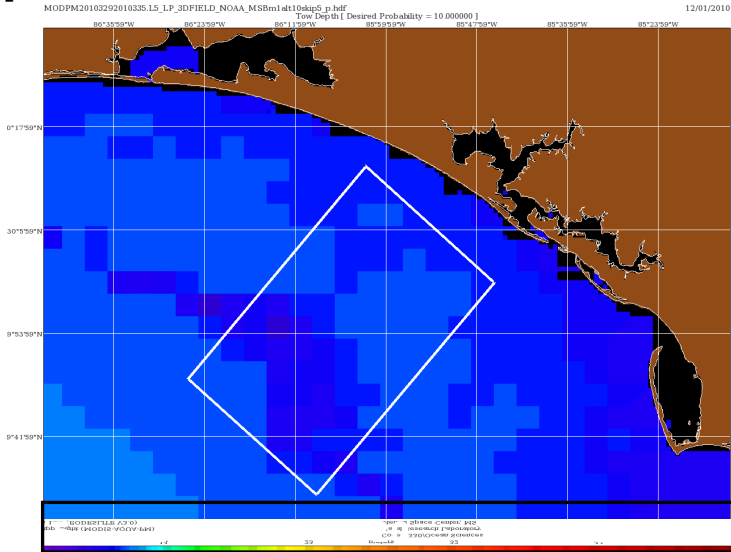


and Vertical Glider Profiles Spatially
by EODES to the 3D Optical Volume



EODES Spatial
Performance

Spatial Performance Surface Map

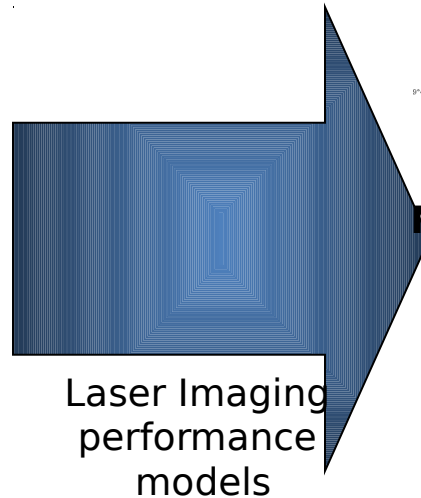
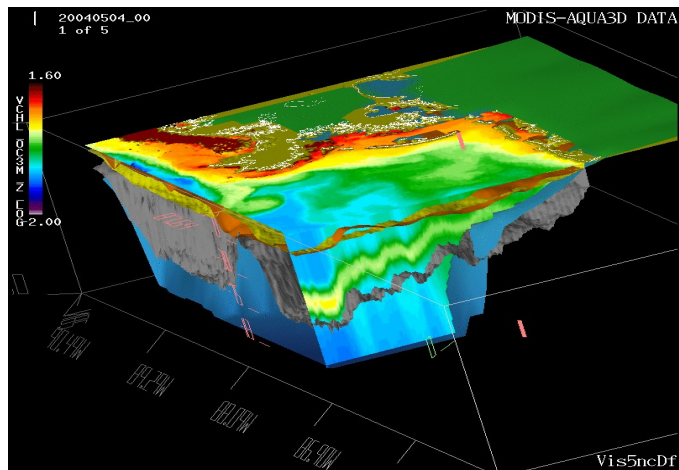


Sensor Optimal Tow Altitude
(Meters)



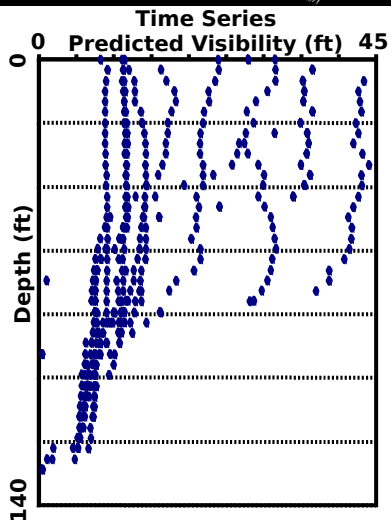
Performance Fields

Battlespace Characterization 3d optical profiles

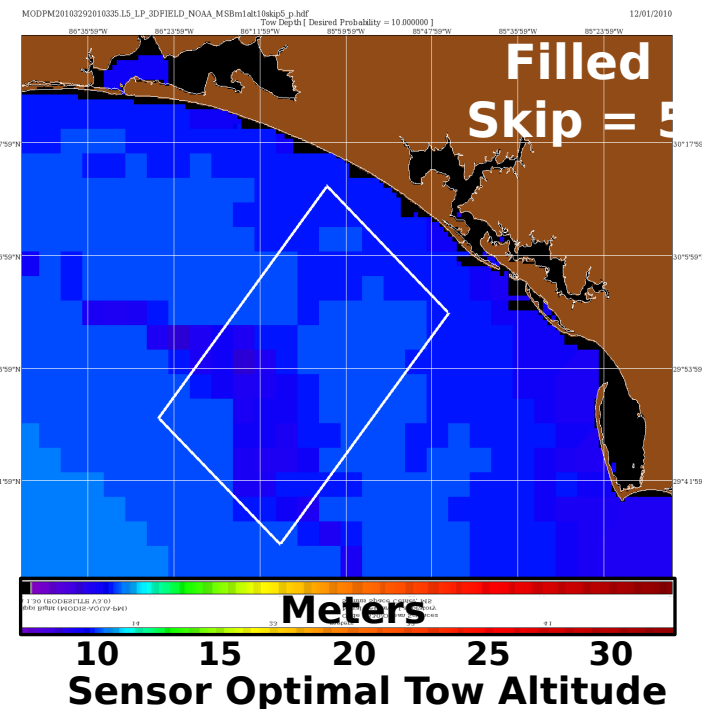
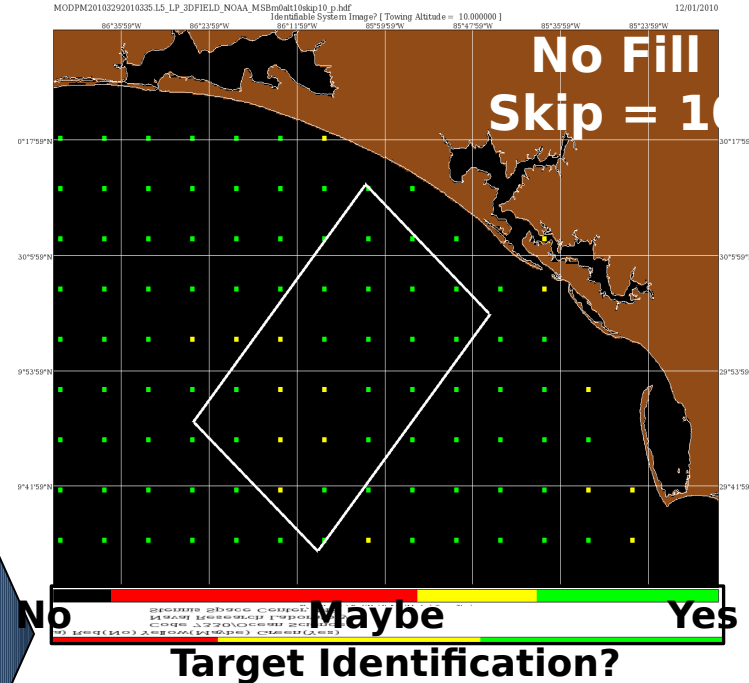


Laser Imaging
performance
models

Laser Line Scanner



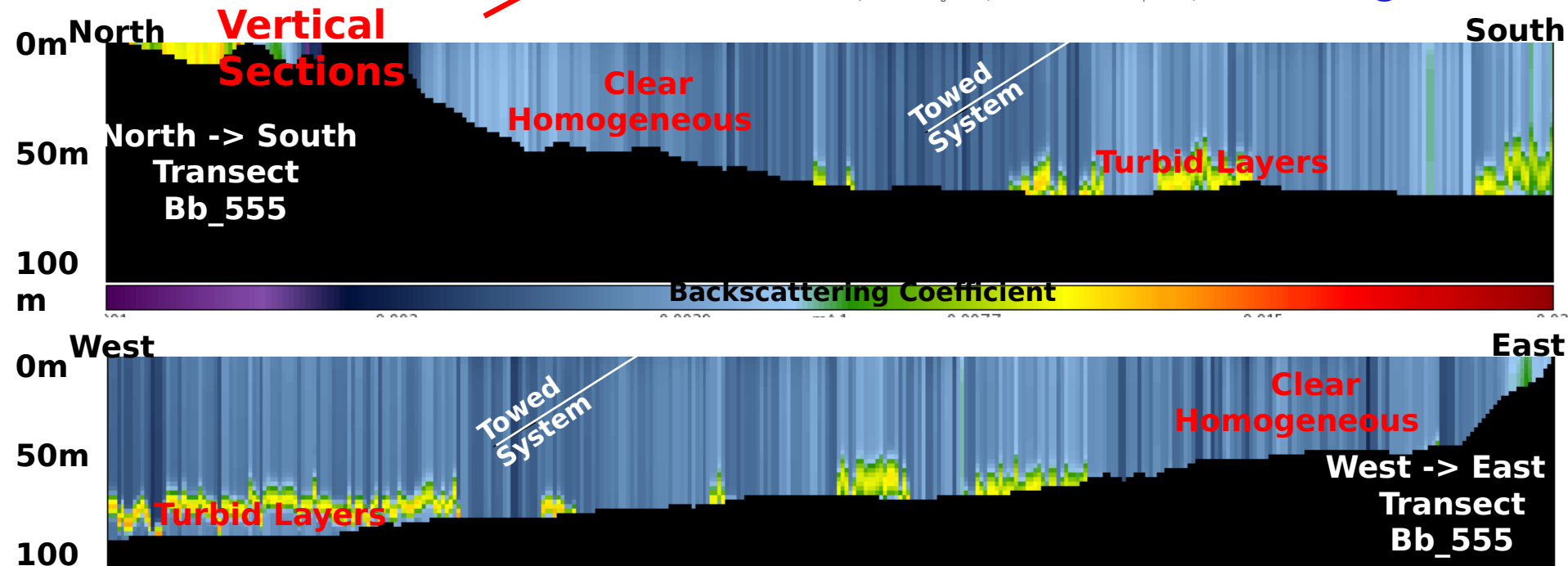
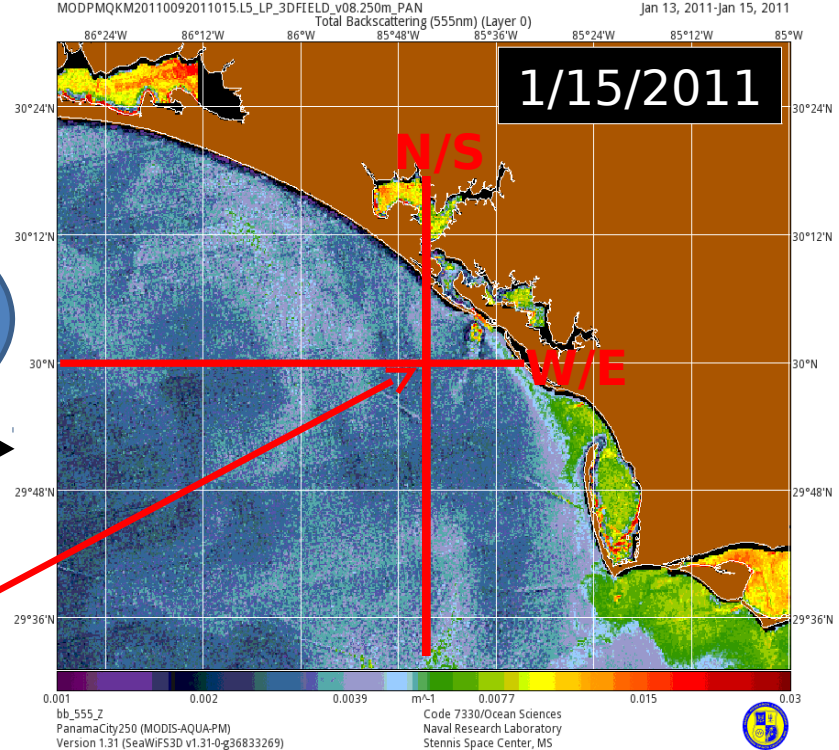
Vertical
Optical
profile



**250m
Resolution**

**3D Optical Volume
Created by
Merging
“Satellite, models and
Insitu data”
Surface to Bottom
Animation
(Black Areas are Bottom)**

LS
Need
Tuning
Daily
Using
Slider



Data Requested for NRL participation



- **Satellite data**



- **Ocean Models**



- **Vertical Optical Profiles**



- **BSP (transmissometer)**



- **Slocum Gliders (attenuation meter)**



- **Laser Line scan**



- Image Snipits**

- Feedback From Diver Ops (If Available)**



Required	Requested 1	Requested 2	
a			Satellite data stream in place
a			Data stream in place
			Profiles use for: tuning optical Volume & validation
	a		
		a	
		a	Images used for validation
		a	Visibility Reports

Daily Exercise Support Products

VULCANEX (3/21/11 - 4/11/11?)

Current Glider Track and Location

Forecast

Waypoints

CW 3/25/11

~20Z

G1 3/26/11

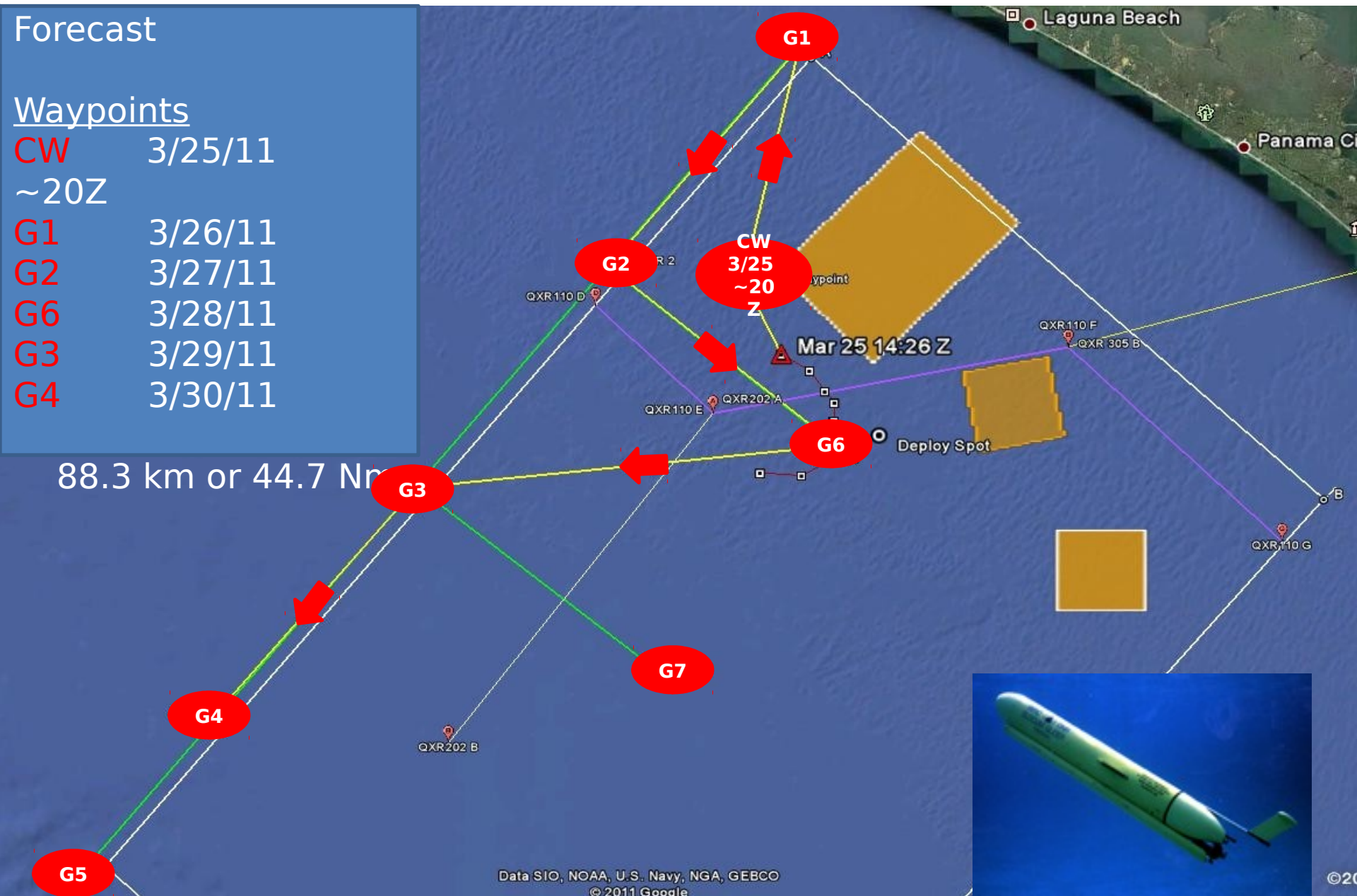
G2 3/27/11

G6 3/28/11

G3 3/29/11

G4 3/30/11

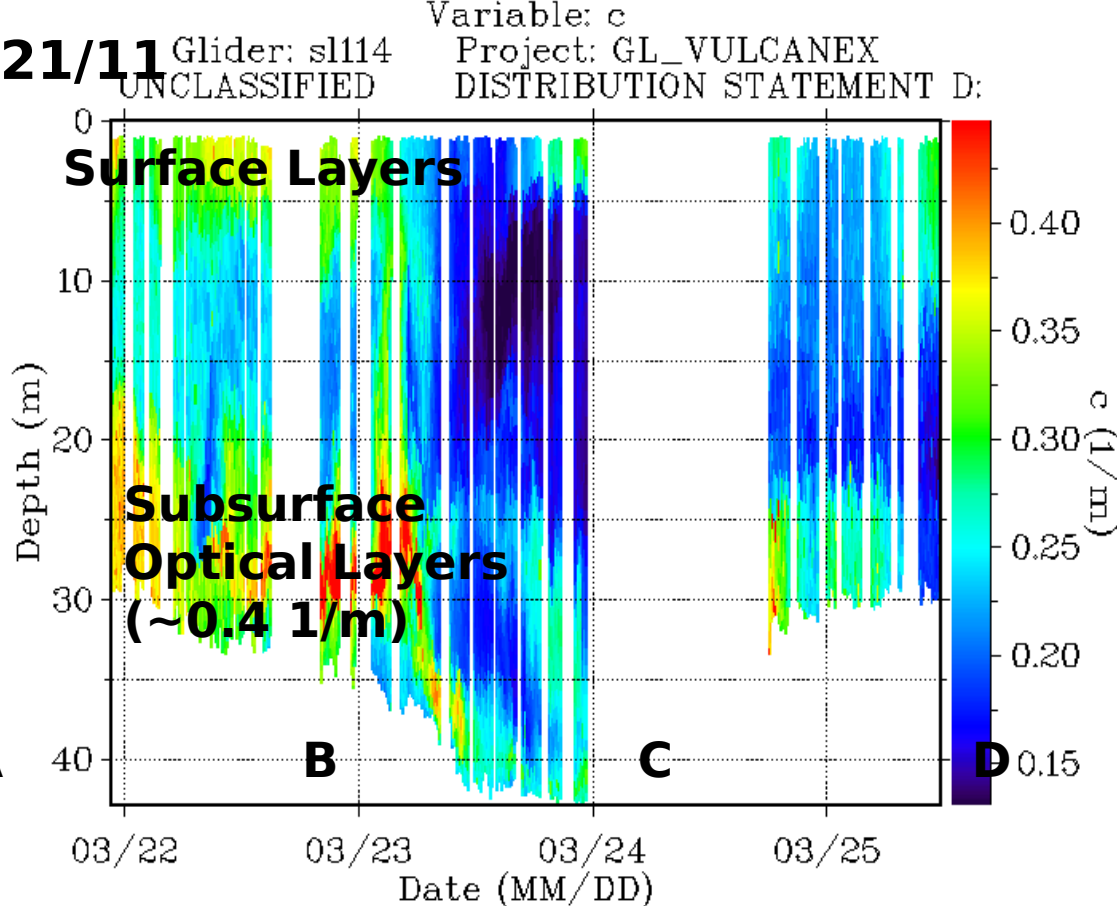
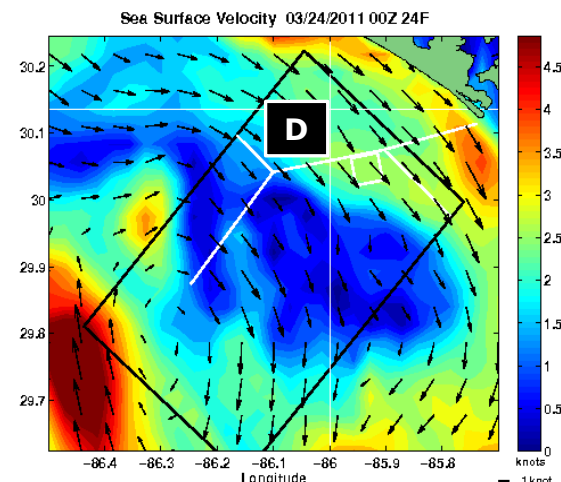
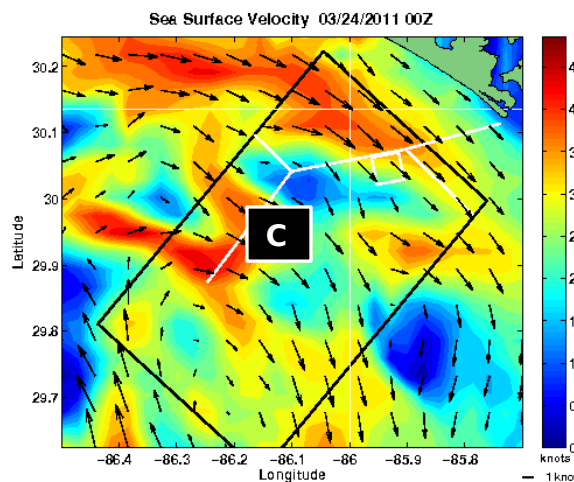
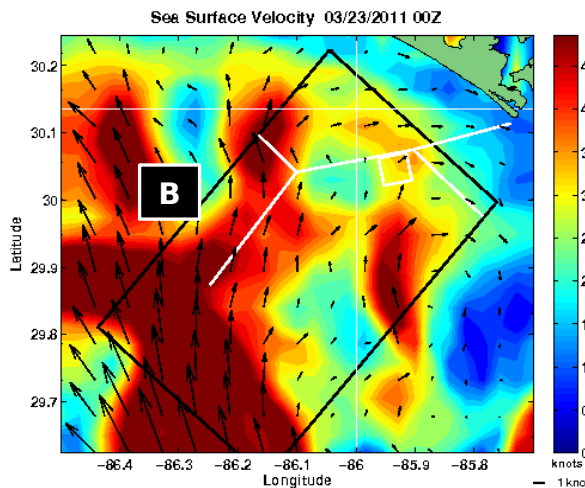
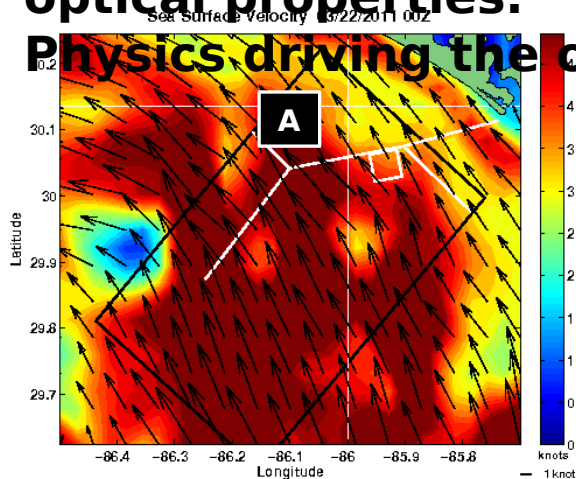
88.3 km or 44.7 Nm



Physics Glider Deployed on 3/21/11

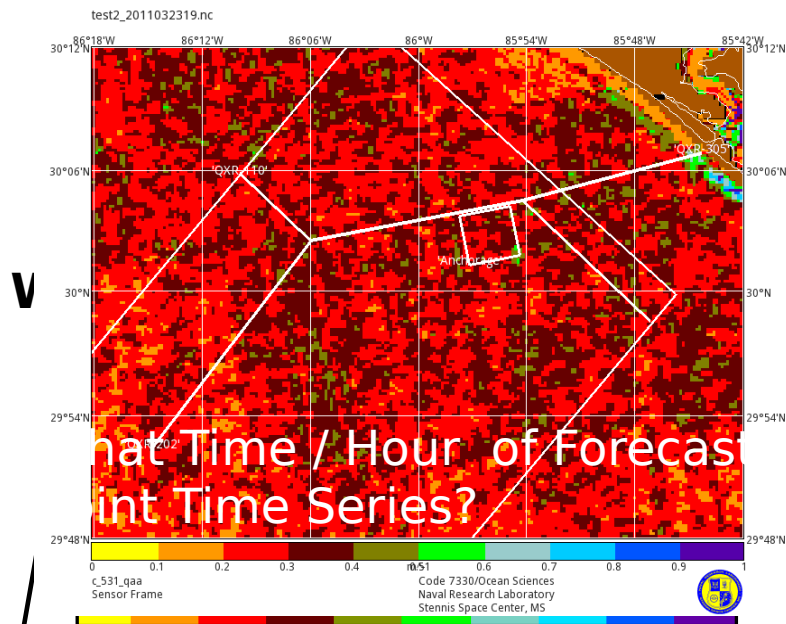
Direction and speed of surface currents can change within days causing subtle changes in surface and subsurface optical properties.

Physics driving the optics.



NowCast AQS-24 Support for March 23, 2011 19Z

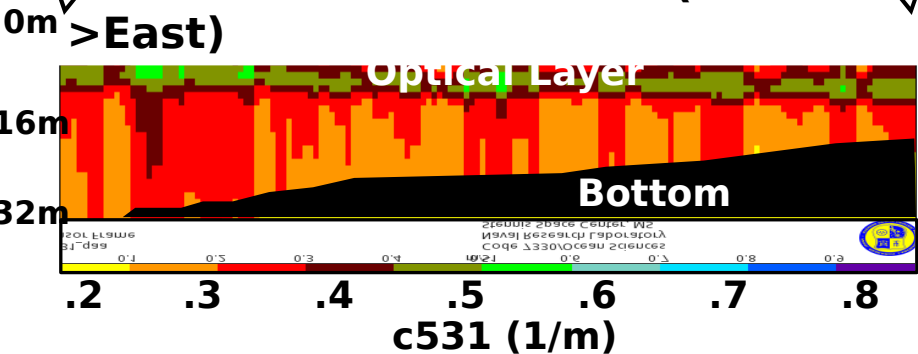
Surface Beam-c (NowCast)



0 .1 .2 .3 .4 .5 .6 .7 .8 .9

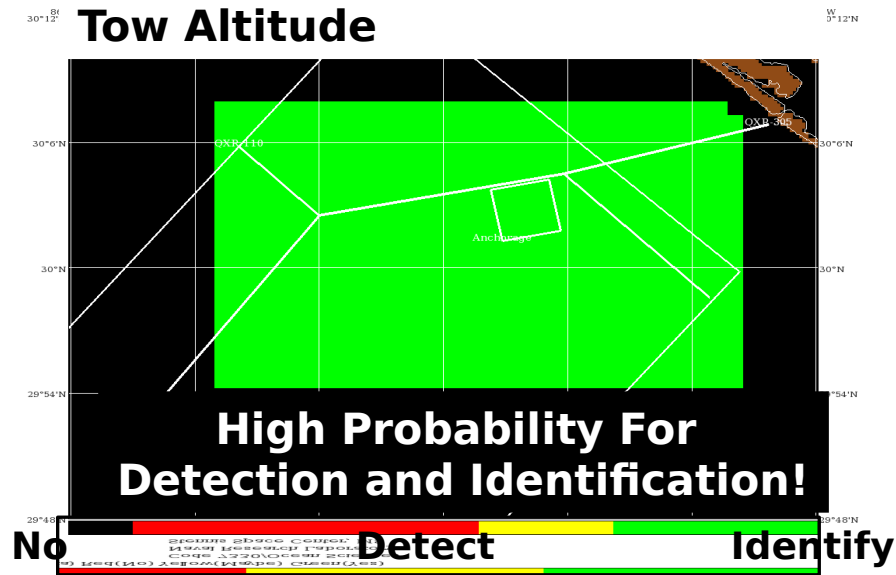
c531 (1/m)

Beam-c 3D Slice (West- >East)

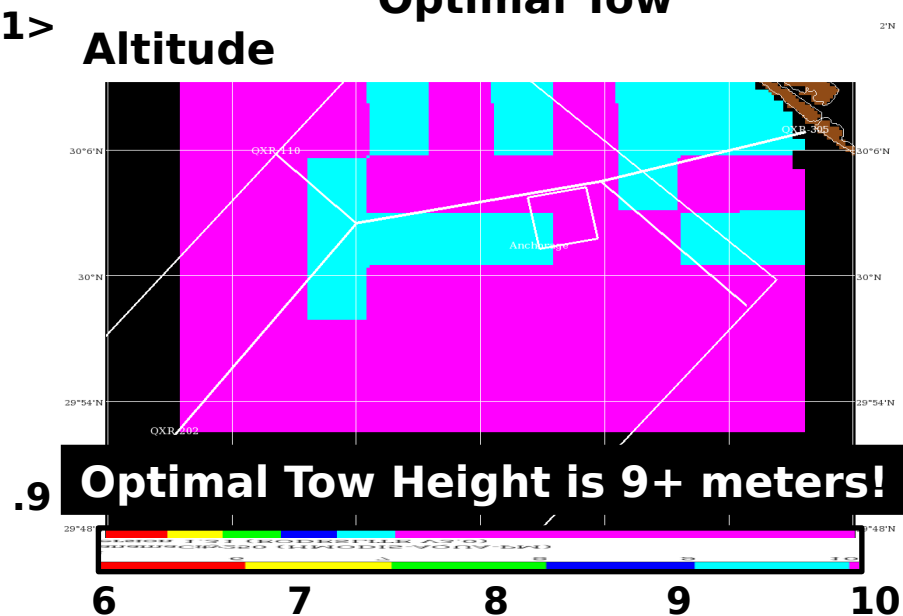


<5

Target Identification @ 6m Tow Altitude

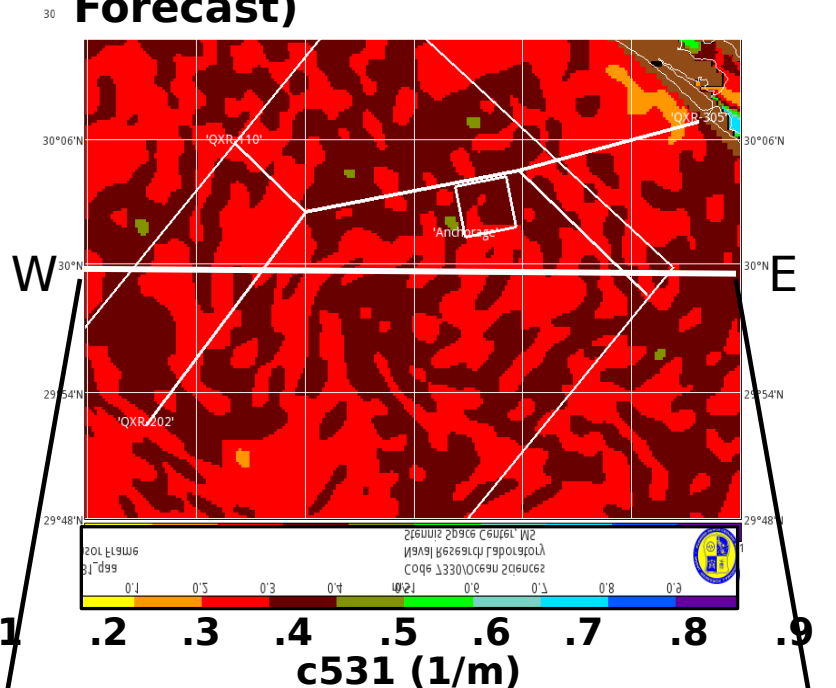


Optimal Tow Altitude



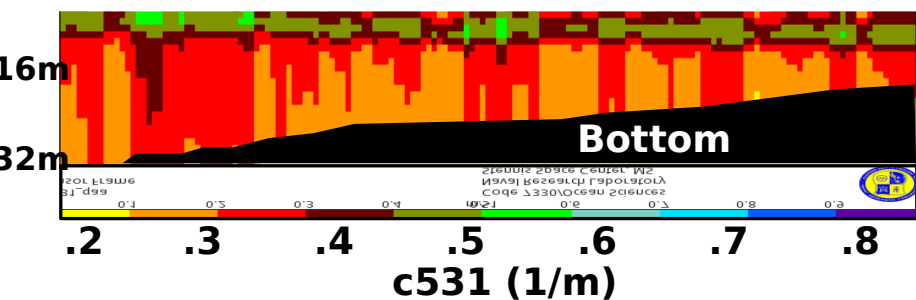
Forecast AQS-24 Support for March 24, 2011 19Z

Surface Beam-c (24 Hour Forecast)



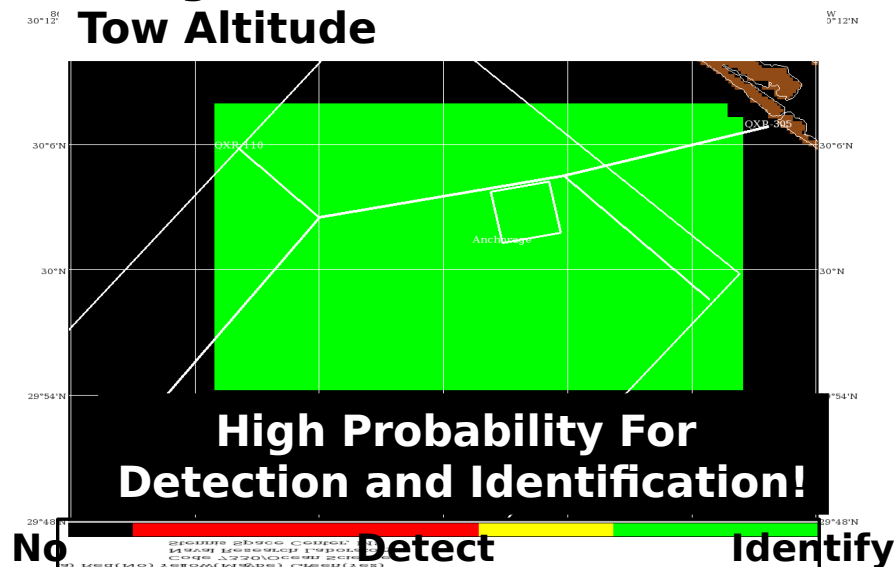
Beam-c 3D Slice (West-East)

0m > East



<5

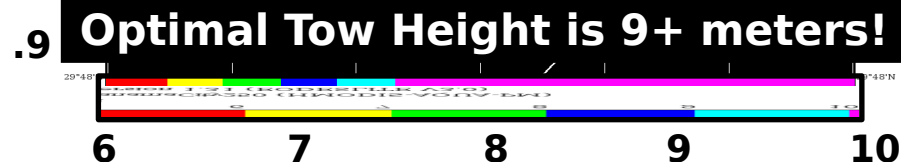
Target Identification @ 6m Tow Altitude



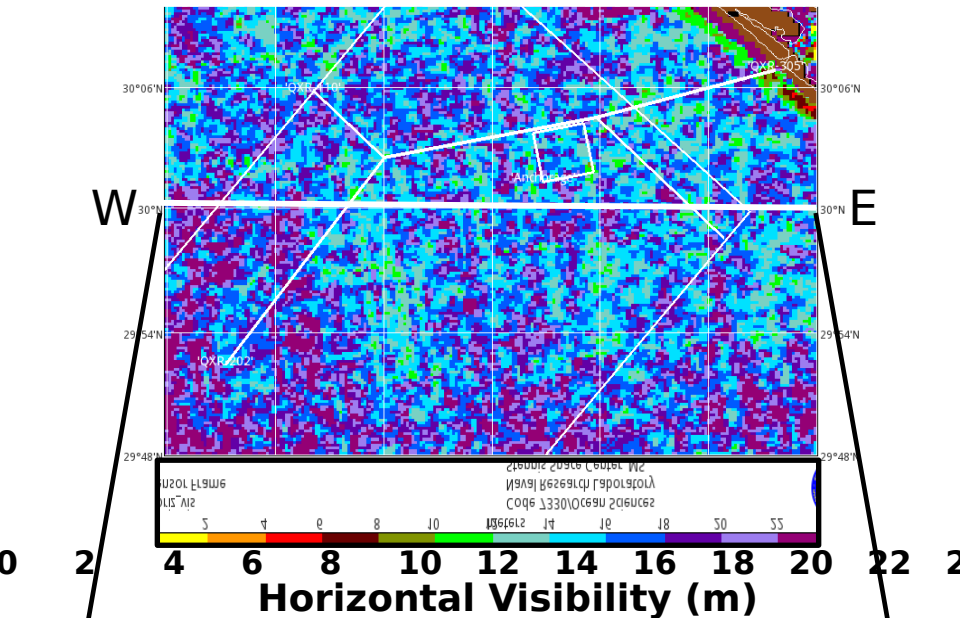
Optimal Tow Altitude = 9+ meters

1>

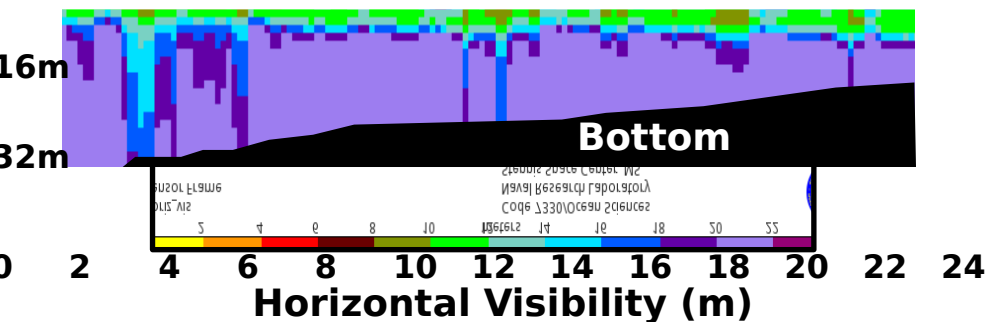
Optimal Tow Height is 9+ meters!



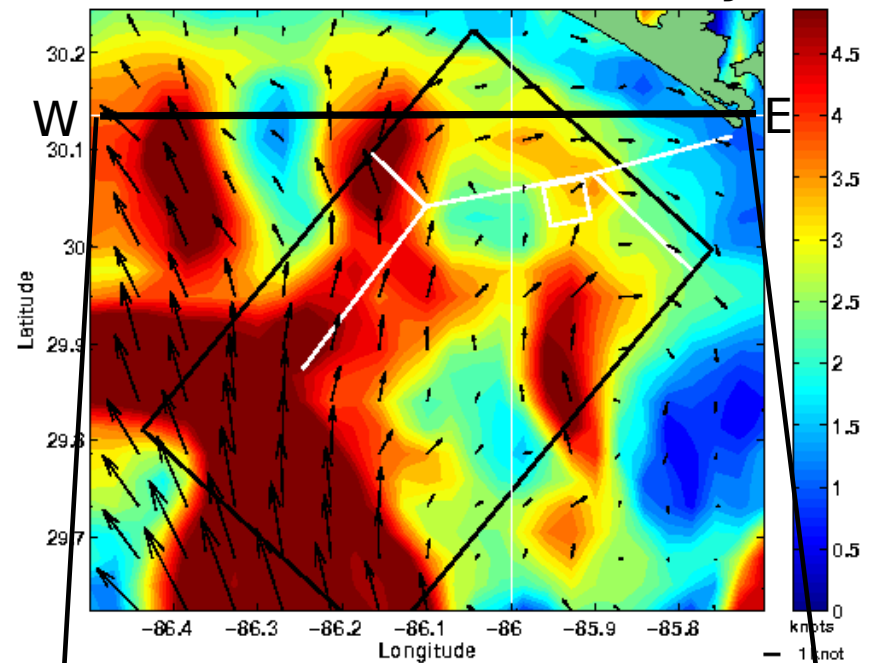
Surface Horizontal Diver Visibility (NowCast)



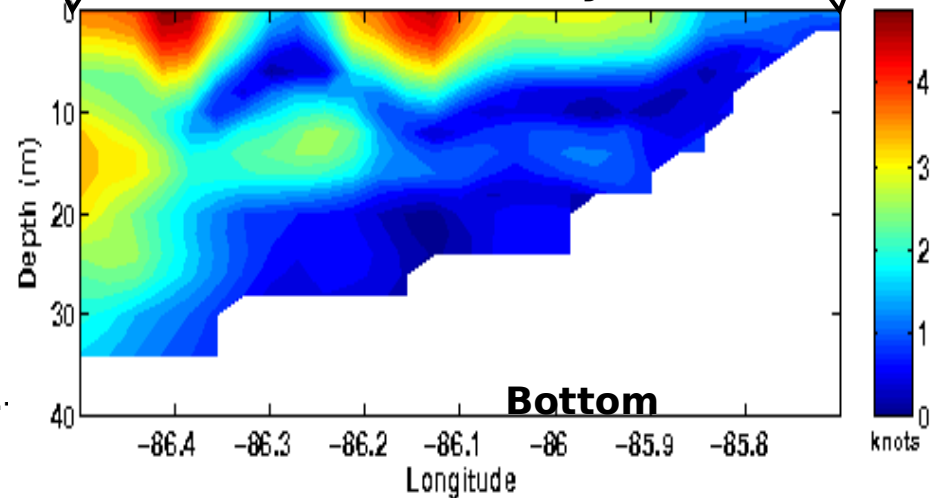
Diver Visibility 3D Slice (West->East)



Surface Current Velocity

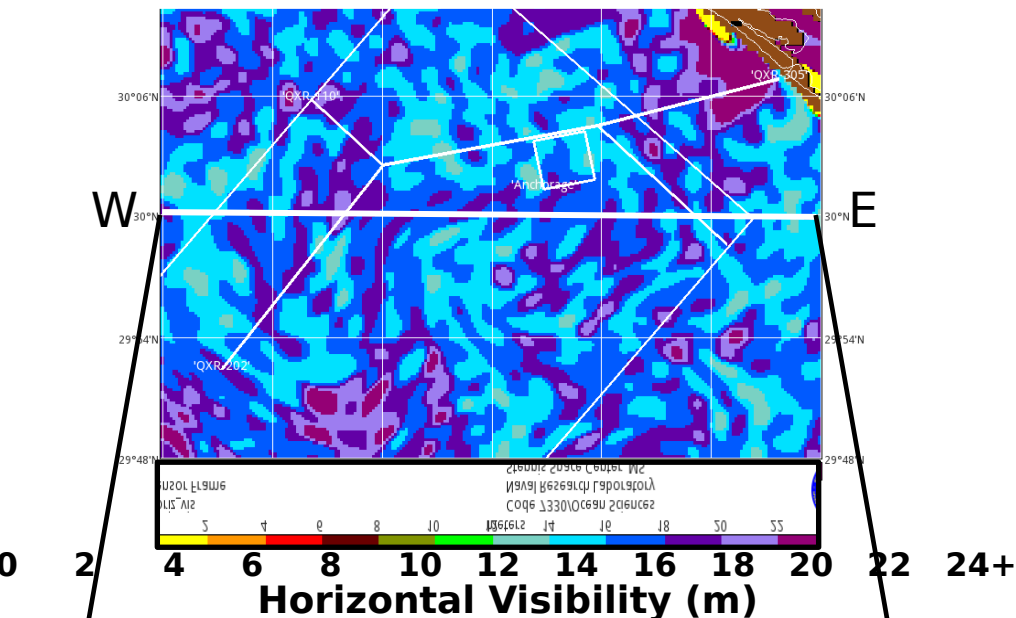


Subsurface Current Velocity Slice at 30.14

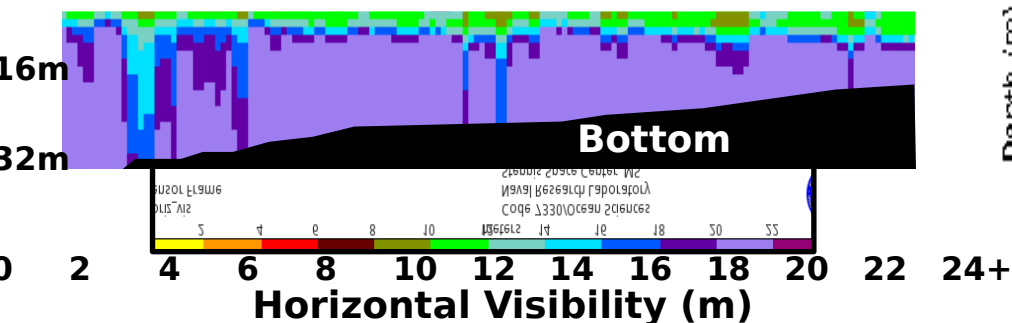


Forecasted Dive Support for March 24, 2011 19Z

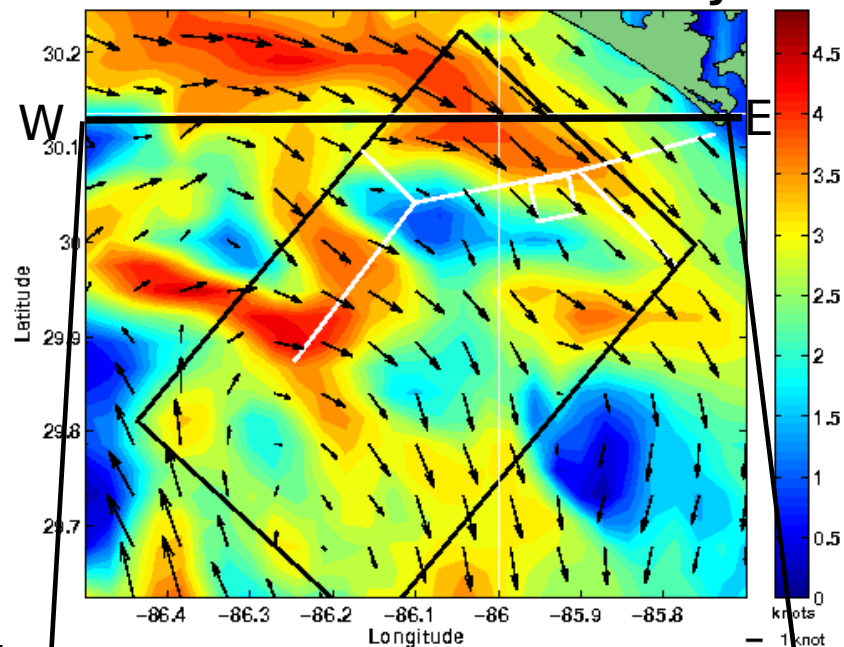
Surface Horizontal Diver Visibility (24Hr Forecast)



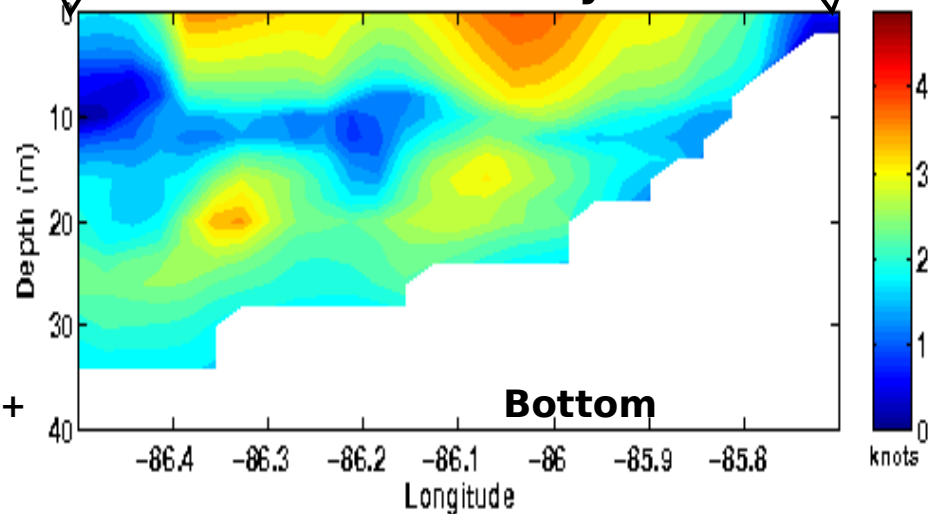
Diver Visibility 3D Slice (West->East)



Surface Current Velocity



Subsurface Current Velocity Slice at 30.14



Summary Slide – From Kevin

Questions?

Please send any feedback via email (ladner@nrlssc.navy.mil)

Positive

Negative

How Products being used?

Changes?